



Application of neural networks to the study of the influence of diet and lifestyle on the value of bone mineral density in post-menopausal women

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ARTICLE INFO

Article history:

Received 4 October 2010

Received in revised form 11 November 2010

Accepted 17 November 2010

Keywords:

Osteoporosis
Bone mineral density (BMD)
Genetic algorithms (GA)
Artificial neural networks (ANN)
Machine learning

ABSTRACT

Osteoporosis is characterized by low bone mineral density (BMD). This illness has a high-cost impact in all developed countries. The aim of this article is the development of a mathematical method able to predict the BMD of post-menopausal women, taking into account only certain nutritional variables. This research applies neural networks for the study of the influence of diet and lifestyle on the value of bone mineral density in post-menopausal women.

A questionnaire on nutritional habits and lifestyle was drawn up. The variables obtained from this, together with the BMD of the patients calculated by densitometry, were processed using genetic algorithms in order to reduce the number of input variables. Finally, a neural network model using only those variables considered important was applied.

It has been proved to be possible to build a neural network model able to forecast the BMD of post-menopausal women according to their responses to the questionnaire. This model can be used to determine which women should take a densitometry in order to verify their bone quality and thus prevent some risks associated with osteoporosis.

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1. Introduction

Approximately 8 million women and 2 million men in the United States have osteoporosis, and 34 million people have osteopenia [1]. Roughly half of all white women will experience an osteoporotic fracture in their lifetime [2,3]. Osteoporosis also occurs in older men, who have a higher mortality from hip fractures and a lower frequency of screening and treatment [4,5]. Overall, hip fractures cause an excess mortality of 10%–20% at 12 months, and up to 25% of patients with hip fractures require long-term nursing home care [2]. In 2002, the cost of a hip fracture was estimated to be \$34,000–\$43,000, with the annual cost of all osteoporotic fractures as high as \$18 billion [1].

Osteoporosis is characterized by low bone mass and structural deterioration of bone tissue, leading to an increased risk of fractures. The World Health Organization (WHO) defines osteoporosis as a spinal or hip bone mineral density (BMD) of 2.5 standard deviations or more below the mean for healthy, young women (T -score of -2.5 or below) as measured by dual energy X-ray absorptiometry (DEXA) [6]. Osteopenia is defined as a spinal or hip BMD between 1 and 2.5 standard deviations below the mean [3,6].

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